Monopsony Employer

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Thanks for the opportunity to present

- Hi. I am Charles Leung.

- would like to meet all of you someday... but the pandemic has the upper hand right now...

- Preliminary & incomplete; please feel free to ANY question ANYTIME...

- my email: kycleung@cityu.edu.hk

- ANY comment or suggestion would be welcome...

Stylized Facts

• $\uparrow$ in concentration in many industries (Bajgar et al., 2019; Covarrubias et al., 2019; Gutiérrez and Philippon, 2017; Rossi-Hansberg et al., 2018).

• Autor et al. (2020) examine U.S. micro data:

(i) industry sales increasingly concentrate on a small number of firms;

(ii) industries where concentration rises most have the largest declines in the labor share;

(iii) the industries that are becoming more concentrated will exhibit faster productivity growth.

Rinz (forthcoming) employs USA admin. data:

national 4-digit NASC concentration no change;

commuting zone 4-digit NASC concentration declines over time;

Azar et al. (2020b) study the "disaggregate labor market" by *6-digit SOC occupation*:

Average number of recruiters in each market ≈ 2.3.

$\Longrightarrow$ *Perhaps* the labor market is *not* that competitive?

$\Longrightarrow$ A *Few* firms *"decide"* the market wage?

This paper:

- parsimonious model of monopsony employer
- then extend to multiple firm, heterogeneous workers
- explore intra- and inter-firm income inequality.
- Some numerical examples.
- (NOT explain WHY monopsony power exists; but WHAT WOULD Happen...)

Main Results (*in case you need to rush*...)

- under-employ; under-pay (relative to social planner)
- inequality: $>$ or $<$ than social planner
- wage compression; (see numerical examples)

Related literature:

Bhaskar and To (1999, 2003): static, monopsony employer

Manning (2006): *competitive vs monopsony* labor market: *whether* the total labor cost to a firm increases with employment; UK data

Azar et al. (2020a, b) and Dube et al. (2020): USA labor market concentrated @ occupation or task level.

Berger et al. (2019): DSGE, oligopolistic firms. Workers receive *additional* payoff from *some particular firms* over the other firms.

Salop (1979); Calvo (1985): Unemployment as a discipline device.

Shaprio and Stigitz (1984): search model, moral hazard; unemployment; labor market is competitive.

Baseline Model: Monopsony, Homogeneous Workers

Time is discrete; horizon $= \infty$.

A "village," a monopsony (single employer),

A mass of homogeneous villagers of size N.

Firms, Villagers: risk-neutral; common discount factor $0 < \beta < 1$.

Timeline for each period: *(time subscripts suppressed)*

1. Firm decides to hire L workers, wage: each worker $= w$.

2. Firm sends 1st-round offers to the former employees. These ex-workers simultaneously decide whether to accept or reject the offer.

3. If there are still openings $\Longrightarrow$ send 2nd-round offers to all other villagers until the firm hires L workers.

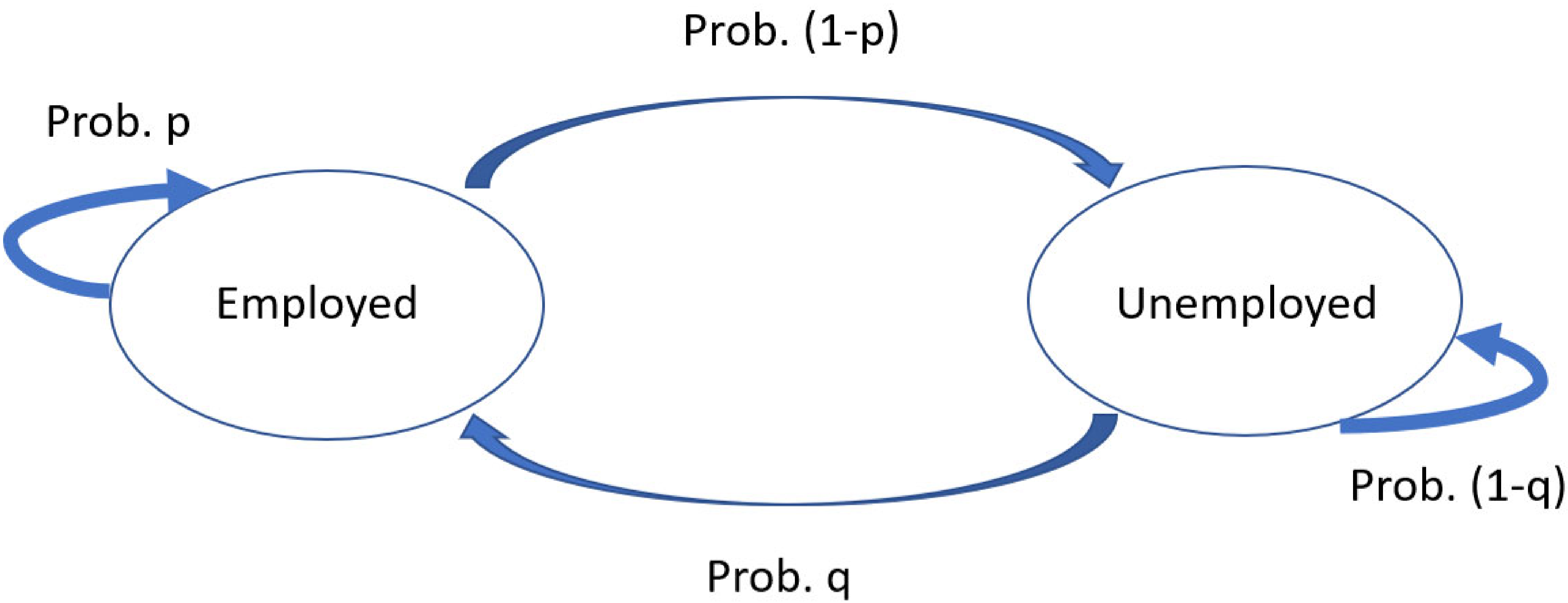
4. (If no job offer or not accept the offer, the villager gets b).

5. Each worker: simultaneously decides whether to *put in effort or shirk* during the production. If effort $= 0 \Longrightarrow$ output $= 0$. To put effort $\Longrightarrow$ disutility cost $c > 0$;

6. output $= \begin{cases} A > 0 & probability = p \\ 0 & probability = 1 - p \end{cases}$.

7. Thus, shirking or luck $\Longrightarrow$ output $= 0 \Longrightarrow$ workers laid off $\Longrightarrow$ be re-hired with probability q.

8. If $l \leq L$ workers put in effort $\Longrightarrow pl$ retained by the firm, the firm needs to hire $L - pl$ from the pool of size $N - pl$ so that $q = \frac{L-pl}{N-pl}$.


Prob. (1-p)
Prob. p
Employed
Unemployed
Prob. (1-q)
Prob. q

Quick comments:

- Diamond-Mortensen-Pissarides Basic model:

job separation is exogenous: correlation w/ performance $= 0$

Prob (separation| good output) $=$ Prob (separation| bad output)

- Here is a moral-hazard model:

job separation is endogenous: correlation w/ performance $= 1$

Prob (separation| good output) $= 0$; Prob (separation| bad output) $= 1$

Per period payoff of a villager V,

$$V = \begin{cases} w - c & \text{if the villager is hired and puts in the effort,} \\ w & \text{if the villager is hired and shirks, and} \\ b & \text{if the village is not hired.} \end{cases}$$

Per period payoff of firm Π, if hires L workers, and $l \leq L$ put effort, $\Pi = Apl - wL$.

If $l = L$, $\Pi = (Ap - w) L$.

Constraints

• Assume expected revenue $>$ effort cost, $Ap > c$.

• (*Incentive Constraint)* Effort today $\Longrightarrow$ chance for guaranteed job (wage) Next period. If No effort today $\Longrightarrow$ must search job next period,

$$\beta\left(pw + (1-p)\left[qw + (1-q)\,b\right]\right) - c \geq \beta\left[qw + (1-q)\,b\right],$$

or $p\,(1-q)\,(w-b) \geq c/\beta$.

• (*Participation Constraint)* "Outside Option" $= b$,

hence $\beta\left(pw + (1-p)\left[qw + (1-q)\,b\right]\right) - c \geq \beta b$,

or $\left[q + p\,(1-q)\right](w-b) \geq c/\beta$.

• (Feasibility constraints) $w \geq 0$, $0 \leq L \leq N$.

Market Solution

Suppose all put effort $l = L$. Firm: same problem each period,

$\max_{w,L} \Pi = (Ap - w)\, L$, subject to constraints.

Define $\phi = \sqrt{\frac{1-p}{p} \frac{c}{\beta(Ap-b)-c}}$.

For $0 < \phi < 1$, we need $Ap > \frac{c}{p\beta} + b \Leftrightarrow Ap > w^*$.

If instead $\beta p\,(Ap - b) < c$, then the firm would prefer to shutdown.

Proposition 1 *In a single firm village, the firm would not hire all workers and only L^* of them, $L^* = (1 - \phi) N < N$,*

$$L^* = (1 - \phi) N < N. \tag{1}$$

The equilibrium wage w^* is independent of N, but negatively related to the unemployment rate ϕ,

$$w^* = \frac{c}{\beta}\left(1 + \frac{1-p}{p}\frac{1}{\phi}\right) + b. \tag{2}$$

Notice that

No aggregate shock $\Longrightarrow$ cyclical unemployment $= 0$.

Only 1 employer, 1 type of job $\Longrightarrow$ structural unemployment $= 0$.

No search-and-matching friction $\Longrightarrow$ frictional unemployment $= 0$.

Production technology is linear: Marginal Productivity of Labor: No change with an additional worker.

Why unemployment?

(1) the employee cannot commit to putting effort,

(2) the employer cannot observe the effort directly.

$\Longrightarrow$ Firm exercises monopsony power: unemployment as an incentive scheme
$\Longrightarrow$ workers to provide effort.

On this aspect, this model has the same accent as Shapiro and Stiglitz (1984).

Social Planner Solution

(We will use the term "social planner" and "government" interchangeably.)

Social planner: allocation of consumption goods to each worker (“wage”) w, the amount of villagers who would be hired (“employment”) L and the amount of goods allocated to each non-worker (“unemployment benefit”) b.

Assume all L workers put in the effort.

Social welfare: "profit" of the firm, $(Ap - w)\,L$, welfare of workers, $(w - c)\,L$, and those unemployed, $b(N - L)$. Hence, total government welfare is

$$\boldsymbol{W} = (Ap - w)\,L + (w - c)\,L + b\,(N - L) = (Ap - c)\,L + b\,(N - L)$$

s.t. (resource constraint) $ApL \geq wL + b\,(N - L)\,,$

(technical condition) $Ap > \frac{c}{p\beta} + b + 2\sqrt{\frac{1}{\beta}\frac{1-p}{p}bc}.$

Proposition 2 *The social planner would choose zero unemployment benefit $b^{**} = 0$, and offers wage w^{**} and total employment L^{**}, $L^{*} < L^{**} < N$*

$$\begin{aligned} w^{**} &= pA, \\ L^{**} &= \left(1 - \frac{1-p}{p}\frac{c}{\beta Ap - c}\right)N. \end{aligned}$$

Duopsony

A monopoly seldom sustains long (Gasmi et al., 2002; Spulber and Yoo, 2014).

This section: a village with 2 firms and N villagers.

WLOG, firm 1 is at least as productive as firm 2, or $A_1 \geq A_2$.

$\Longrightarrow L_i$, w_i, and q_i potentially different.

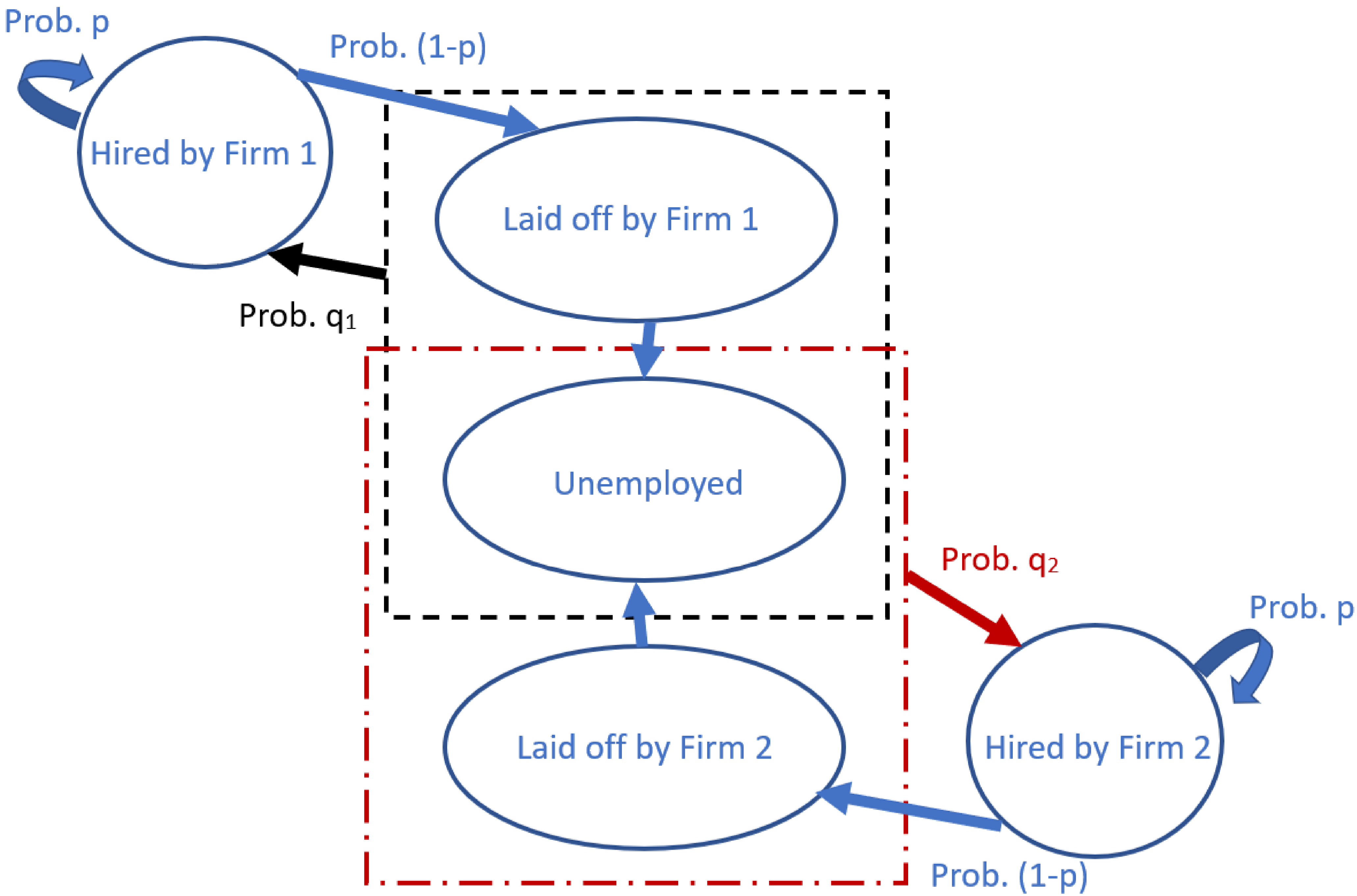
Timeline for each period:

1. Each firm i simultaneously decides employment L_i + wage w_i, take (L_j, w_j) as given.

2. Each firm extends the offers to existing workers first. These workers can decide to accept or reject the job offer.

3. If there are still openings, each firm will send second-round offers to other villagers. If hired by firm $i \Longrightarrow$ receives wage w_i. No job? receives b.

4. Like Monopsony case, effort $= 0 \Longrightarrow$ output $= 0$. Effort $> 0 \Longrightarrow$ output $A_i > 0$ with probability p.



Prob. p
Prob. (1-p)
Hired by Firm 1
Laid off by Firm 1
Prob. q1
Unemployed
Prob. q2
Prob. p
Laid off by Firm 2
Hired by Firm 2
Prob. (1-p)

Suppose effort > 0. Then firm i problem: $\max_{w_i, L_i \leq N - L_j} \Pi_i = pA_iL_i - w_iL_i$

subject to the feasibility constraint $b \geq 0$, $w_i \geq 0$, and $0 \leq L_i \leq N$,

participation constraint $[q_i + p(1 - q_i)](w_i - b) \geq c/\beta$,

and *incentive constraint* $p(1 - q_i)(w_i - b) \geq c/\beta$.

Technical condition (expected product large enough): $pA_i > \frac{c}{p\beta} + b$ for $i = 1, 2$.

$\phi_i =$ equilibrium unemployment rate IF firm $i =$ only firm,

$$\phi_i = \sqrt{\frac{1-p}{p} \frac{c}{\beta \left(pA_i - b \right) - c}}. \tag{3}$$

$A_i, p \uparrow \implies \phi_i \downarrow$

Define

$$\mathbf{\Psi} = \frac{\phi_1 \phi_2}{\phi_1 + \phi_2 - \phi_1 \phi_2}. \tag{4}$$

Will show: $\mathbf{\Psi} =$ village's unemployment rate with 2 firms.

Proposition 3 *The social planner would choose zero unemployment benefit* $b^{**} = 0$*, and offers wage*

$$w^{**} = pA$$

and the total employment is

$$L^{**} = \left(1 - \frac{1-p}{p}\frac{c}{\beta Ap - c}\right) N < N,$$

$$L(monopsony) < L_1 + L_2 < L(social\ planner)$$

$$0 < w_2^* < w_1^* < w(social\ \ planner)$$

Notice: Under the social planner, only the most productive firm in operation.

Gini coefficient under asymmetric duopsony:

$$G = \underbrace{\frac{N-L}{N}}_{\substack{\text{unemployment}\\ \text{rate}}} \underbrace{-\frac{(N-L)\,b}{w_1 L_1 + w_2 L_2 + (N-L)\,b}}_{\substack{\text{total unemployment}\\ \text{benefit } \textit{relative to}\\ \text{total income}}}$$

$$+ \underbrace{\frac{L_1 L_2}{N} \frac{w_1 - w_2}{w_1 L_1 + w_2 L_2 + (N-L)\,b}}_{\substack{\text{weighted sum of}\\ \text{wage difference}\\ \text{between workers}}}$$

Proposition 4 *Consider a 2-firm village under with a low unemployment benefit level $b \leq b^*$, where*

$$b^* = \frac{c}{\beta}\frac{1-p}{p}\frac{(1-\phi_1)(1-\phi_2)(\phi_2-\phi_1)}{(\phi_1\phi_2)(\phi_1+\phi_2-\phi_1\phi_2)}.$$

The social planer solution would bring more equality than the market. Plus,

(a) If the 2 firms have the same productivity, the duopsony village achieves a higher level of equality than the monopsony if and only if

$$\frac{c}{\beta}\left(1+\frac{1-p}{p}\frac{1}{\phi}\right)(1-\phi)(1-\Psi) \geq (\phi+\Psi-1)\,b.$$

(b) If the 2 firms are different but similar productivity, and $b=0$, the duopsony village achieves a higher level of equality than the monopsony.

Duopsony with Heterogeneous Workers

There are 2 types of workers: low (l) and high (h). Population of type $j = N_j$, $j = l, h$, and $N = N_l + N_h$.

The type of a villager is public information.

Labor markets of different types of workers are segmented: e.g., one type of worker is a tailor, and another type of worker is a writer.

Type j worker in firm i: if effort > 0, revenue $= A_{ij}$ with probability p and 0 with probability $1 - p$.

$L_{ij} =$ amount of type j villagers hired by firm i, and wage offer $= w_{ij}$.

Per period payoff of a villager of type j working for firm i is V_{ij},

$$V_{ij} = \begin{cases} w_{ij} - c & \text{if the villager is hired and puts in the effort,} \\ w_{ij} & \text{if the villager is hired shirks,} \\ b & \text{if the village is not hired.} \end{cases}$$

Per period payoff of the firm i when L_{ij} of type j workers are hired, and $l_{ij} \leq L_{ij}$ put in effort:

$$\Pi_i = \sum_{j=h,l} \Big(pA_{ij} l_{ij} - w_{ij} L_{ij} \Big) .$$

Define $\phi_{ij} = \sqrt{\frac{1-p}{p}\frac{c}{\beta(A_{ij}p-b)-c}}$ and $\mathbf{\Psi}_j = \frac{1}{\sum_{i=1}^{m}\frac{1}{\phi_{ij}}-1}$.

Proposition 5 *Equilibrium employments for type $j = h, j$ workers at firm i and the total employment of type j workers are*

$$L_{ij} = \frac{1-\phi_{ij}}{\phi_{ij}}\mathbf{\Psi}_j N_j \text{ and } L_j = \left(1-\mathbf{\Psi}_j\right) N_j < N_j. \tag{6}$$

Hence, there is unemployment for both types of workers. The equilibrium wages for type j workers in firm i are

$$w_{ij} = \frac{c}{\beta}\left(1+\frac{1-p}{p}\frac{1}{\phi_{ij}}\right)+b. \tag{7}$$

When firms and workers are complementary, type h workers earn more than type l workers, and the unemployment rate for type l workers is higher than *type h because $\mathbf{\Psi}_l < \mathbf{\Psi}_h$. The more productive firm pays a higher wage, hires more workers but gets a lower share of surplus per worker.*

Some Numerical Examples

- Monopsony case

Recall: each period, a portion $(1-p)$ of the employees, put in efforts, nevertheless receive zero output; be laid off.

Hence, dynamics of unemployment:

$$\Delta U = sL - f\left(U + sL\right),$$

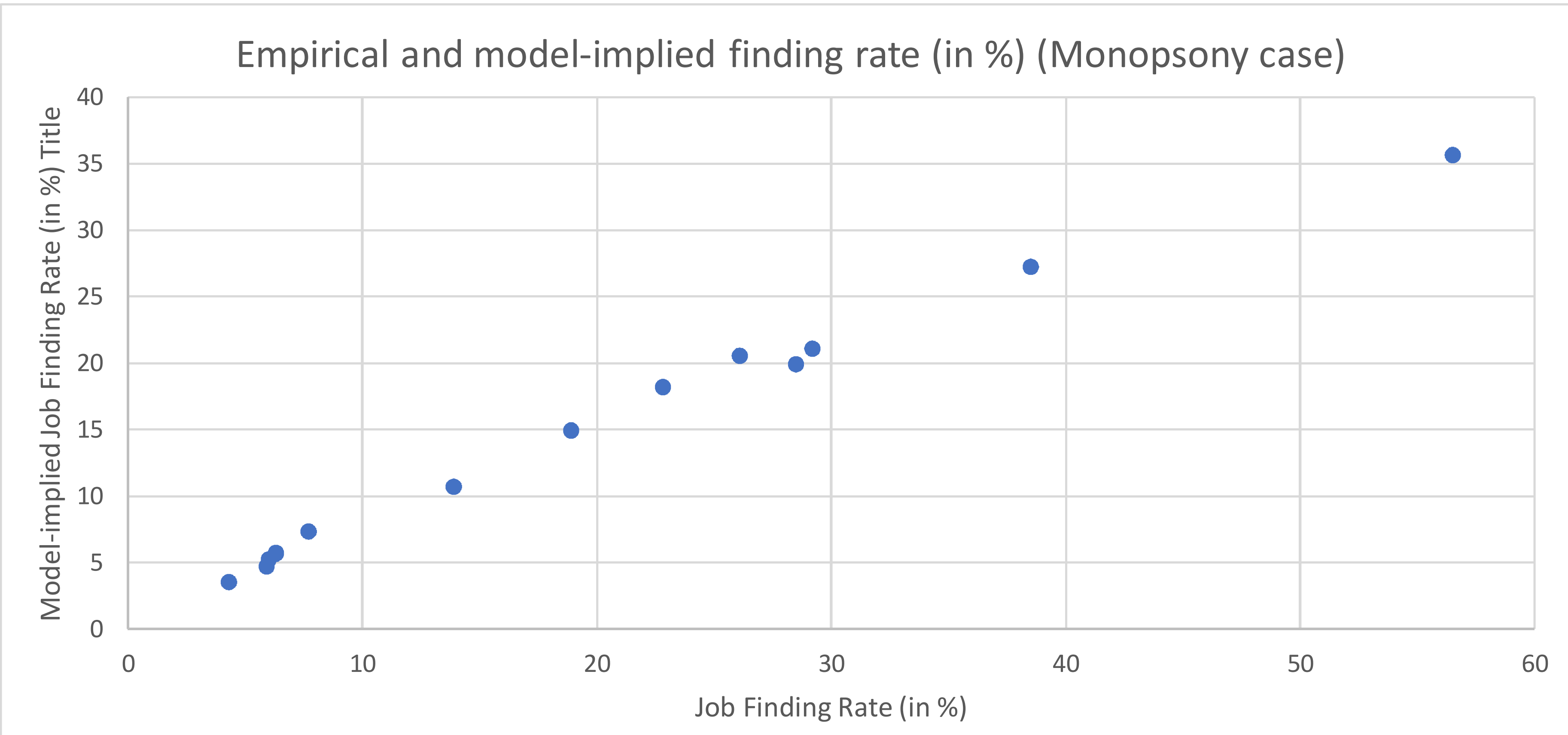
where ΔU = change of unemployment, s = job separation rate, L = total amount of employees, f = job finding rate.

Recall $U = \phi N$, $L = (1-\phi)N \Longrightarrow$

$$s = 1-p,\ f = \frac{(1-p)(1-\phi)}{(1-p)(1-\phi)+\phi}.$$

Elsby et al. (2013): U.S. data: $s = 3.6\%$, $f = 56.5\%$, $\phi = 6.1\%$. $\Longrightarrow$

$p = 1 - s = 0.964$ and $f = \frac{(0.036)(1-0.061)}{(0.036)(1-0.061)+0.061} = 0.356\,57$, i.e., 35.657%, or about $3/5$ of the observed job finding rate.



Empirical and model-implied finding rate (in %) (Monopsony case)
Model-implied Job Finding Rate (in %) Title
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
Job Finding Rate (in %)

- <u>Duopsony case</u>

Dynamics of unemployment:

$\Delta U_i = s_i L_i - f_i\,(U + s_i L_i)$, $i = 1, 2$.

$\Delta U = \Delta U_1 + \Delta U_2$

Plus, $U = \Psi N = \frac{\phi_1 \phi_2}{\phi_1 + \phi_2 - \phi_1 \phi_2} N$

$L_i = \left(\frac{1-\phi_i}{\phi_i}\right) \Psi N = \frac{(1-\phi_i)\phi_k}{\phi_1 + \phi_2 - \phi_1 \phi_2} \Psi N, i, k = 1, 2, i \neq k.$

As $s_1 = s_2 = 1 - p \Longrightarrow f_i = \frac{(1-p)(1-\phi_i)}{(1-p)(1-\phi_i) + \phi_i} = q_i$

$f = \frac{\Psi}{\Psi + p(1-\Psi)} \left(\sum_i q_i\right) + \sum_i \frac{p(1-\phi_i)}{\phi_i} q_i$

$\beta = (0.96)^{1/12} = 0.9966$ (Kehoe et al., 2019)

$s = 3.6\%$ (Elsby et al., 2013)

(OECD data) Berlingieri et al. (2017): 90th-10th percentile log productivity difference, 2-digit level, $A_1/A_2 = 5.87$

$A_2 = 1.01$, $b = 0.6$, $c = 0.2 \Longrightarrow$

$\Psi \approx 3.41\% \ << 6.1\%$; $f = 50.50\% \approx 56.5\%$ (all Elsby et al., 2013).

$w_1/w_2 = 1.19$ (homogeneous workers)

- Duopsony case with heterogeneous workers

Assume $A_{ij} = A_i \alpha_j$, $i = 1, 2$, $j = h, l$.

Wolcott (2021): job separation rate s, job finding rate f, unemployment benefit b, all type-specific.

As in the previous examples, we set $\beta = 0.9966$, $A_2 = 1.01$, $c = 0.2$.

Normalization: $\alpha_l = 1$.

Then set $\alpha_h = 1.5$, $A_2 = 1.01$, $A_1 = 1.2$.

Wolcott (2021): $s_l = 0.0326$, $s_h = 0.0162 \Longrightarrow p_l = 0.9674$, $p_h = 0.9838$; $N_l = 0.44$, $N_h = 0.56$.

We set $b_l = 0.47$, $b_h = 0.67$.

	$i=1$ $j=l$	$i=2$ $j=l$	$i=1$ $j=h$	$i=2$ $j=h$
w_{ij}	0.728	0.716	0.925	0.916
L_{ij}	0.232	0.177	0.297	0.243
q_{ij}	0.197	0.157	0.201	0.171

Employemnt rates: $L_l/N_l = 92.9\% < L_h/N_h = 96.6\%$.

Wolcott (2021): (data) $L_l/N_l = 83\%$, $L_h/N_h = 92\%$.

Our model: $w_h/w_l = \sum_i L_{ih}w_{ih}/\sum_i L_{il}w_{il} = 1.68$.

Wolcott (2021): $w_h/w_l = 1.40/0.81 = 1.7284$.

$f = N_l f_l + N_h f_h \approx 0.50$; 0.565 (data)

Concluding Remarks

Handwerker & Dey, 2019: megafirms NOT responsible for wage inequality $\nearrow$

This paper: monopsony firms $\Longrightarrow$ under-pay, under-employ (relative to social planner); wage compression

Theoretical: more extensions

Empirical: some applications?

THANK YOU!